

# SCENARIO PLANNING 6

## ANTICIPATING THE FUTURE WITH SCENARIO PLANNING

Long-range transportation planning deals with a variety of social, demographic, fiscal, and environmental possibilities that can, individually or in combination, have a profound impact on future conditions. The purpose of planning is not to forecast each detail of a future society with complete certainty, but rather to envision and anticipate possible changes and to suggest strategies to deal with these future realities.

Scenario planning is one useful tool to help accomplish this.

RVAMPO's CL RTP 2035 uses scenario planning to look at specific trends or events that are likely to occur during the time horizon of this plan. Specifically, this chapter deals the following four scenarios:

- Retirement of Baby Boom Generation
- Global Climate Change
- Fuel and Energy Prices
- Water and Sewer Service Expansion

These trends have significant implications for long-range transportation planning, and the forces contributing to the trends are likely to remain relevant throughout the time horizon of this plan.

## RETIREMENT OF BABY BOOM GENERATION

### BACKGROUND

This scenario helps guide the long-range transportation planning process with issues concerning the retirement of the Baby Boom demographic. In general the term Baby Boom applies to those born just after World War II until 1964. This scenario uses two overlapping age groups which approximate, but do not precisely conform to, the Baby Boom demographic:

- 1) Age Group 1 - those who were age 45 to 64 in the year 2000
- 2) Age Group 2 - those who were age 35 to 54 in the year 2000

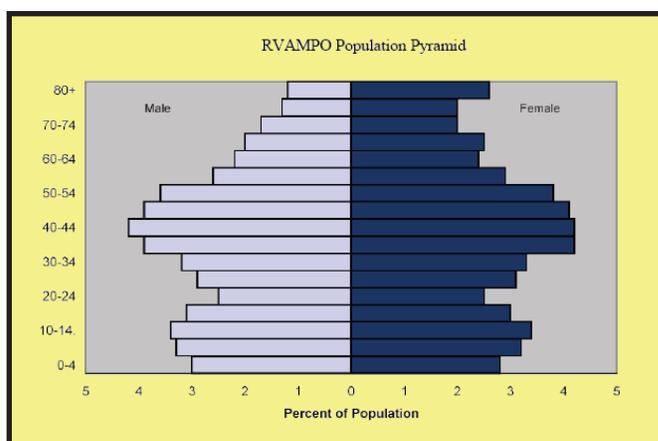
This scenario evaluates these two age groups at two distinct points in the future: year 2020 and year 2030. Members of Age Group 1 will be between 65 and 84 in 2020 and between 75 and 94 in 2030. Members of Age Group 2 will be between 55 and 74 in 2020 and between 65 and 84 in 2030. Two broad assumptions serve as underlying themes throughout this scenario and are designed to assist in discussing the macro issues of Baby Boom retirement in the context of long-range planning.

- 1) Current residents of the region age in place
- 2) Retirees from other regions and some current residents choose retirement housing in the area

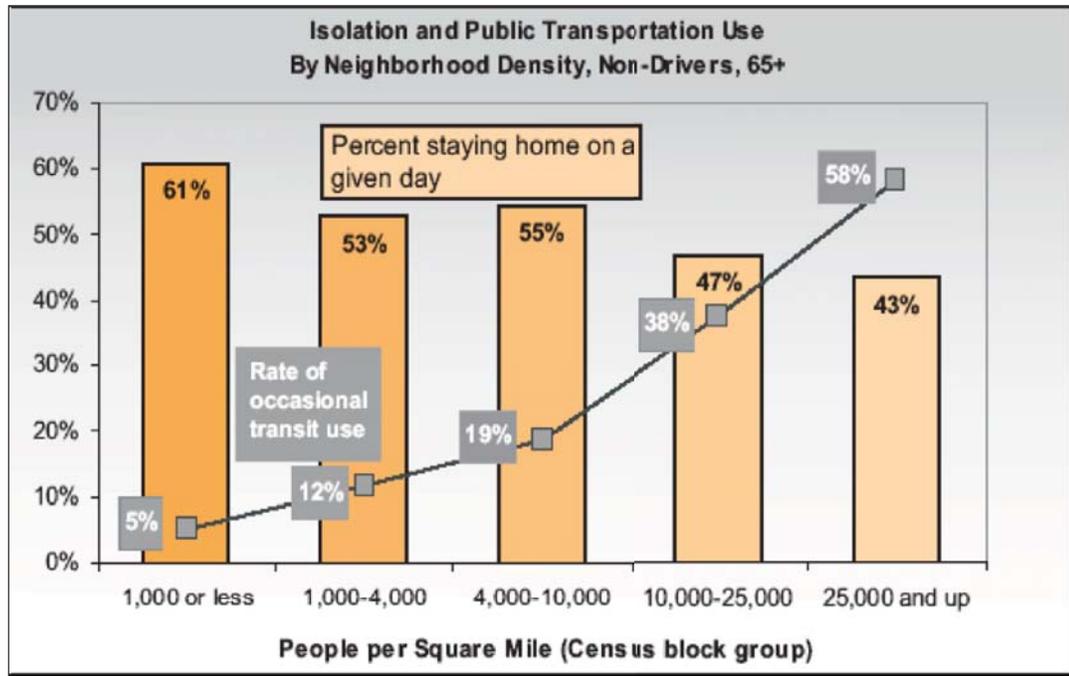
In some cases they will be explicitly stated in the diagrams and maps, in other cases the assumptions will be used for background analysis. Obviously, there are a range of housing options between aging in place and retirement housing. However, this scenario will focus on these two possibilities in order to get a general sense of appropriate transportation strategies.

### PLANNING FOR ELDERLY AND DISABLED MOBILITY

In Fiscal Year 2005, RVAMPO staff developed a report on planning for elderly and disabled mobility. That report can be found at [www.rvarc.org/work/mobilityfinal.pdf](http://www.rvarc.org/work/mobilityfinal.pdf). The Elderly and Disabled Mobility report made use of the RVAMPO Population Pyramid shown to the right (based on Census 2000 data) which shows our two overlapping age groups - Group 1, 45 to 64 in 2000 and Group 2, 35 - 54 in 2000 - comprise nearly 50 percent of the total population.



One important issue the report identified was isolation among non-drivers. The graph below <sup>3</sup> shows the relationship between isolation (that is, those staying home on a certain day,) neighborhood density, and public transportation use.

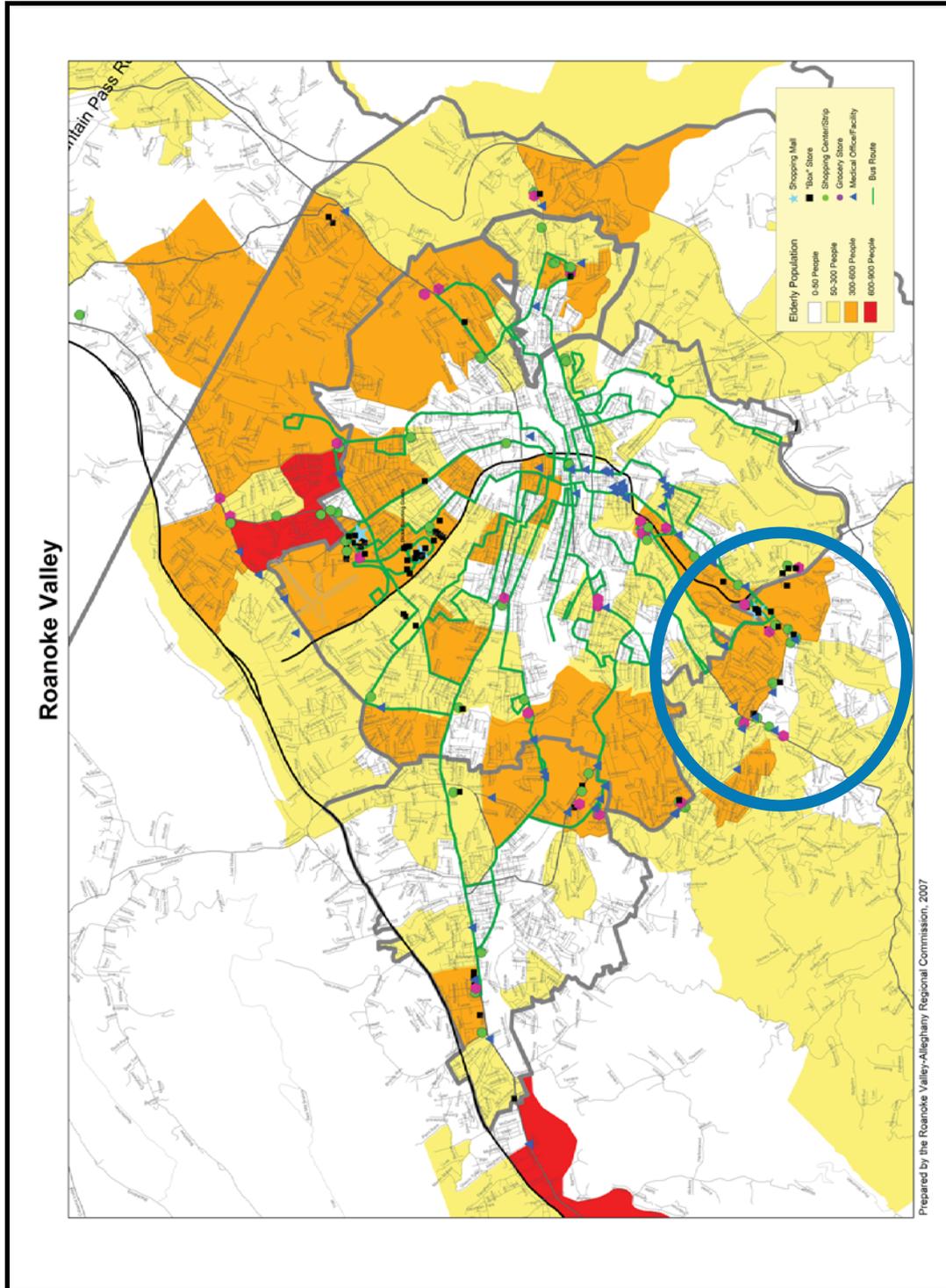


Later in this chapter, this scenario will be incorporated into the “Carless Households” at the TAZ level analysis as reported by the Census Transportation Planning Package (CTPP 2000) for both Group 1 and Group 2. Subsequent analysis considers all households at the TAZ level and represents the potential “Choice Rider” market for transportation alternatives. Members of the “Choice Rider” market may consider one or more transportation alternatives for safety, convenience, health, or social reasons. Transportation alternatives will be presented in the following section. Population density considerations will be addressed at the end of this scenario. In addition, a complementary transportation process (The Coordinated Human Service Mobility Plan) will be described. Although this plan’s focus is broader than only Baby Boomers, many of the issues overlap and will become more relevant as Baby Boomers retire.

The map on the next page shows the relationship between elderly population (current 2000), shopping destinations, medical centers, and bus routes. The light blue circle on the map highlights a concentration of shopping destinations and medical facilities in the Southwest Roanoke City and Roanoke County area that will likely be attractive to the Baby Boom generation as they age. Currently there is no fixed route transit in the Roanoke County portion. This area will be a prime candidate for several of the alternative transportation strategies described later in this plan, which could include public transit service along Electric Road (US 419.) The circled area will be featured later in this scenario due to the large “Choice Rider” market that is predicted to be present in the years 2020 and 2030.

3. Planning for Elderly and Disabled Mobility, RVAMPO FY 2005 - Page 21

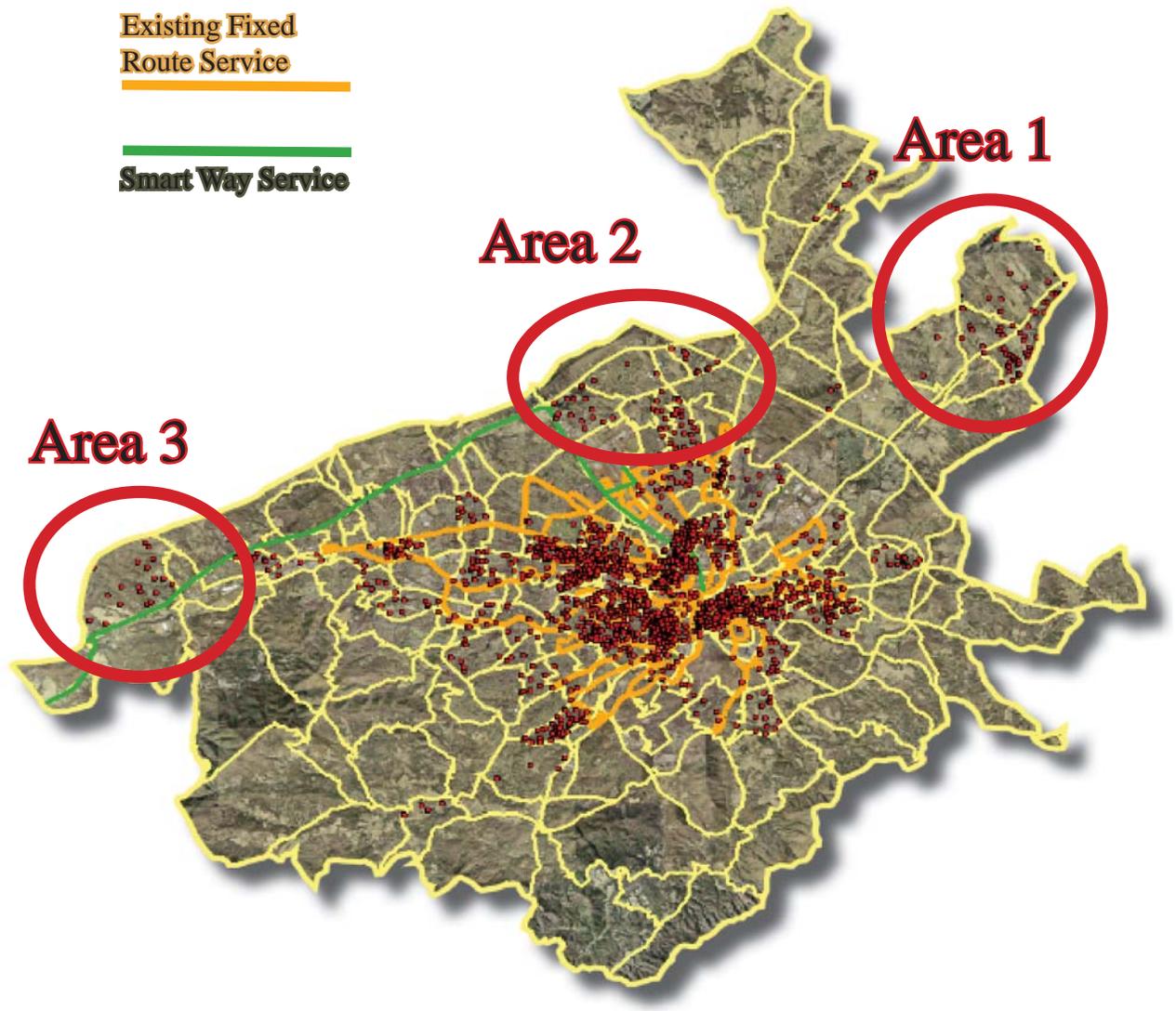
## CONCENTRATION OF SERVICES OF INTEREST TO RETIRED POPULATION



---

---

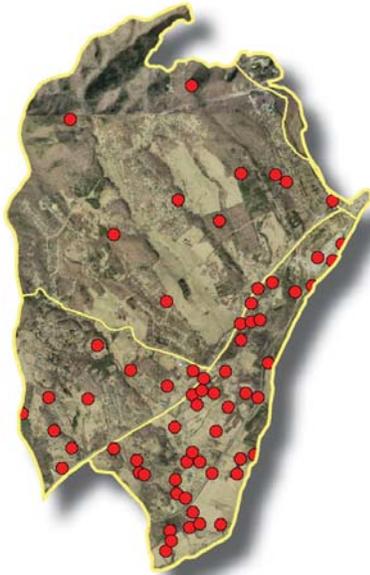
## FUTURE CARLESS HOUSEHOLDS (AGE 65 TO 84 IN 2020)



*Note: Data from CTPP 2000. One dot represents one household. Bedford County TAZ level data was unavailable in CTPP 2000.*

The above map depicts future carless households with the primary householder ranging in age from 65 to 84 in the year 2020. The map follows an “Age in Place” assumption and shows pockets of potential future carless households that lie outside the existing fixed route transit system (Valley Metro) or the Roanoke to New River Valley service (Smart Way). Areas within the circles labeled Areas 1 - 3 will be further detailed on the next page. These are areas within RVAMPO that could benefit from a future feeder type of service that would connect residents in these areas to the fixed route system.

**FUTURE CARLESS HOUSEHOLDS (AGE 65 TO 84 IN 2020) - AREAS 1 - 3**



**Area 1:** TAZs 407, 408, 409 in Botetourt County indicate a possible candidate for transit, paratransit, or taxi feeder service based on an “Age in Place” assumption. Feeder service could connect with Valley Metro’s system via US 460 or deliver patrons for transfer to Valley Metro’s fixed route system.



**Area 3:** Connectivity could be provided through enhanced accessibility such as additional Smart Way Stops.



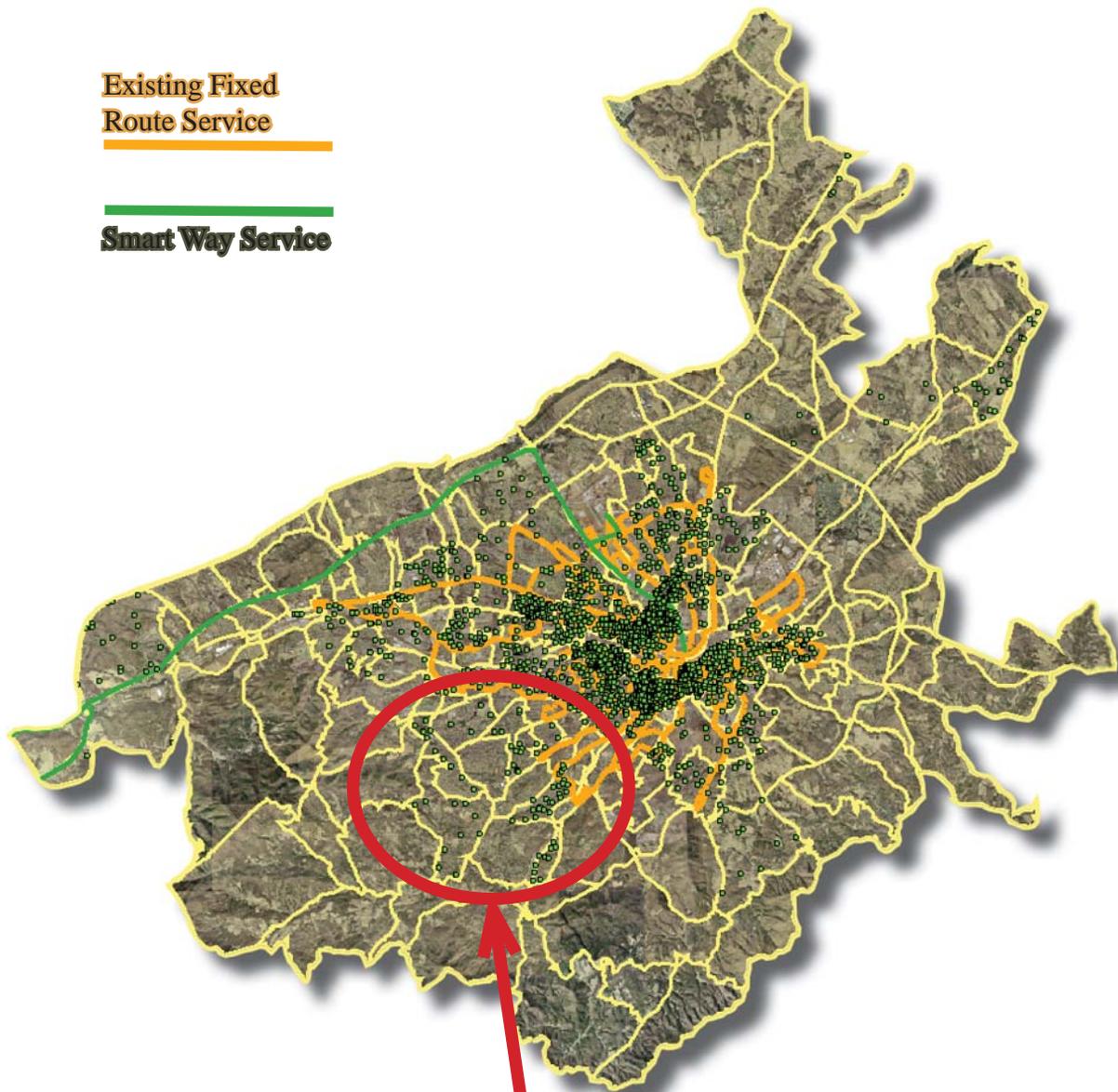
**Area 2:** Connectivity could be provided through enhanced neighborhood accessibility, neighborhood electric vehicles, or special feeder service.

*Note: Data from CTPP 2000. One dot represents one household. Bedford County TAZ level data was unavailable in CTPP 2000.*

---

---

## FUTURE CARLESS HOUSEHOLDS (AGE 65 TO 84 IN 2030)



*Note: Data from CTPP 2000. One dot represents one household. Bedford County TAZ level data was unavailable in CTPP 2000.*

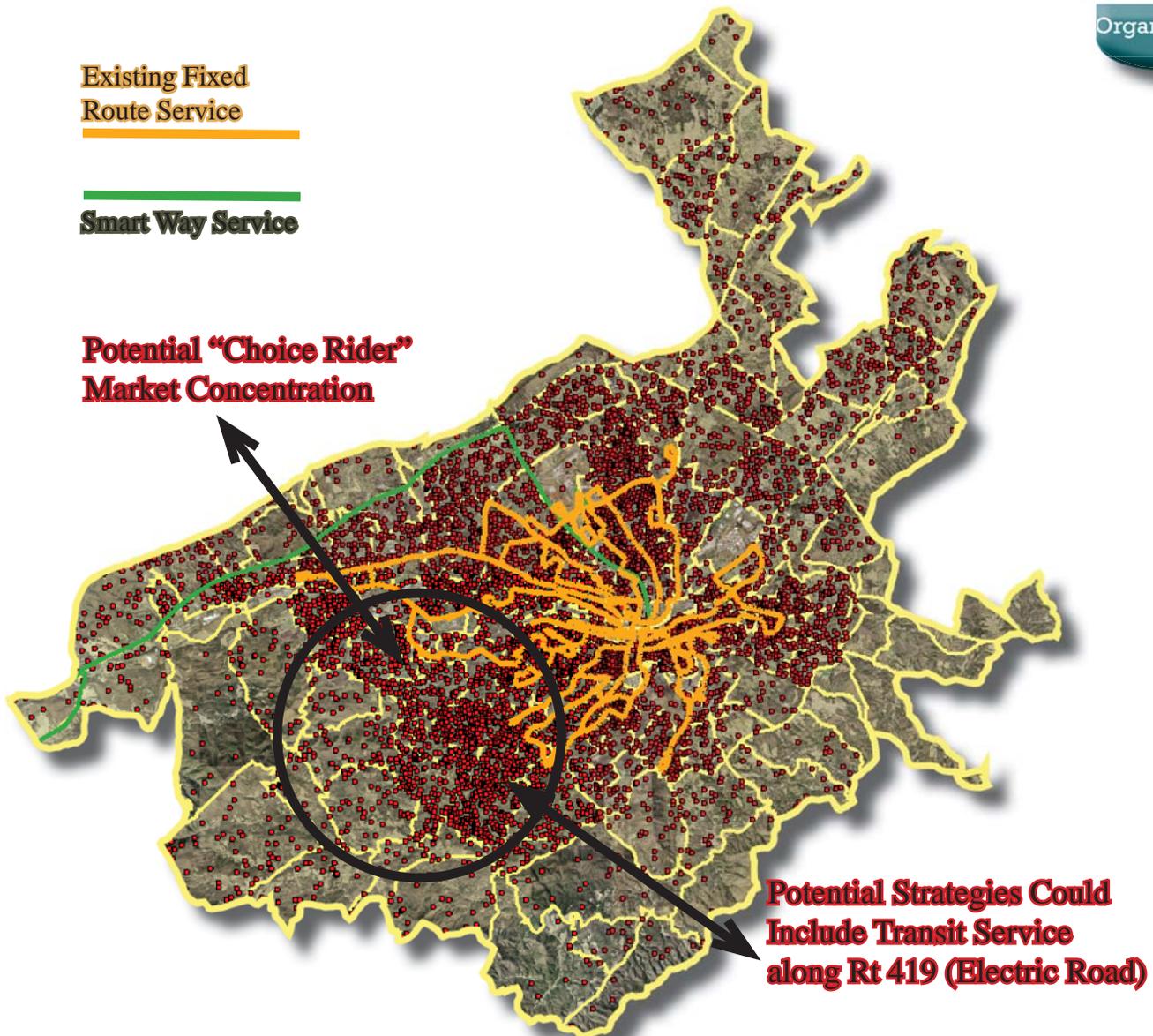
The above map depicts future carless households with the primary householder ranging in age from 65 to 84 in the year 2030 (Age Group #2.) Extending the time horizon from 2020 to 2030 shows an increased concentration of potential future carless households in the Southwest Roanoke City and Roanoke County area. The map follows an Age in Place assumption and shows pockets of potential future carless households that lie outside the existing Valley Metro or Smart Way services.

**FUTURE TOTAL HOUSEHOLDS (AGE 65 TO 84 IN 2020)**

**Existing Fixed  
Route Service**

**Smart Way Service**

**Potential “Choice Rider”  
Market Concentration**



*Note: Data from CTPP 2000. One dot represents four households. Bedford County TAZ level data unavailable in CTPP 2000.*

The above map depicts future households, both with vehicles available and otherwise, with the primary householder ranging in age from 65 to 84 in the year 2020 (Age Group #1.) The map follows an Age in Place assumption and shows pockets of potential retired households that lie outside the existing Valley Metro or Smart Way services. These areas define a potential “Choice Rider” market for transportation services such as public transportation, non-work trip ridesharing, or car sharing systems. Households headed by retired individuals may choose these services for a variety of reasons including but not limited to: financial, social, or safety.

---

---

## FUTURE TOTAL HOUSEHOLDS (AGE 65 TO 84 IN 2030)

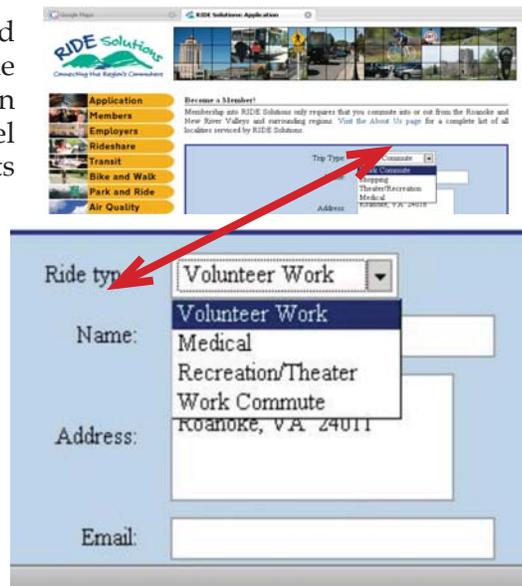


*Note: Data from CTPP 2000. One dot represents four household and Bedford County TAZ level data unavailable in CTPP 2000.*

The above map depicts future households, with vehicles available or otherwise, with the primary householder ranging in age from 65 to 84 in the year 2030 (Age Group #2). Likewise, the geographic pattern for the potential "Choice Rider" market for the second age group extends the trend seen on the previous page. Once again, Southwest City of Roanoke and Southwest Roanoke County show significant concentrations. Potential strategies (such as ridesharing, car sharing, feeder systems, and bicycle/pedestrian accommodations) to address future "Choice Rider" market and Carless Household markets are described in the following pages.

## NON-WORK TRIP RIDESHARING

Traditionally, ridesharing centered around the work trip. However, more recently the non-work portion of all trips has been on the rise. The National Household Travel Survey (NHTS) Brief - April 2007 reports that non-work trips account for 40% to 80% of all peak period trips, depending on day of the week and peak period in question. This trend is likely to intensify as increasing numbers of people move from the full-time work force to part-time work or full retirement. Rideshare programs are uniquely positioned to serve the non-work trip. There are several compelling reasons that future retirees would want to participate in non-work rideshares:



Representation of multi-trip purpose rideshare system.

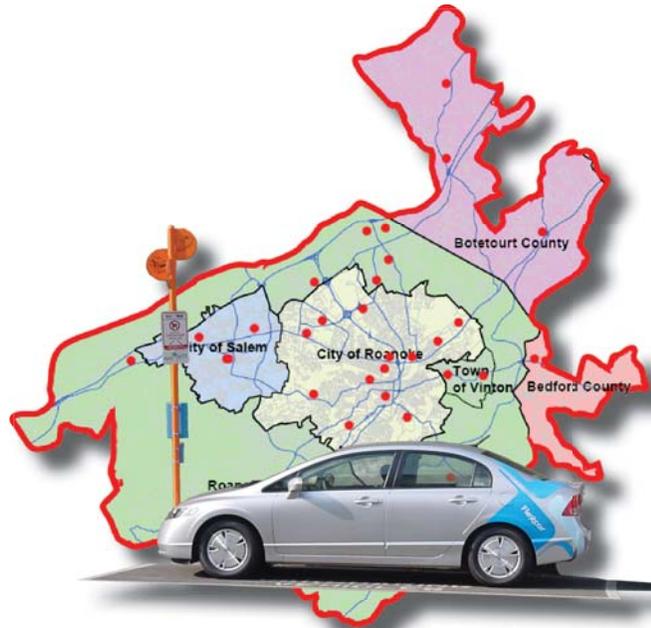
- 1) To share the cost of gasoline and car maintenance
- 2) To maintain social bonds that were provided by the workplace
- 3) To reduce the stress of driving
- 4) To reduce the negative environmental impact of travel.

Rideshare programs can address these issues at a significantly reduced cost compared to traditional highway construction. Although the only immediate costs for non-work trip rideshare management may be software, marketing, and additional employee costs, rideshare programs are sometimes overlooked as an integral part of management of the existing transportation system. Currently the work-commute rideshare program (RIDE Solutions) is funded by a State grant administered by the Virginia Department of Rail and Public Transit (VDRPT). Funding for non-work trip rideshare could come from a variety of sources. Capital expenses, such as the purchase of computers and software, may be eligible for traditional transportation funding sources listed in the CLRTP. Non-work trip rideshare should be given consideration as either a stand alone element or as part of a larger strategy.

Rideshare programs are generally publicly supported and, as such, are free to the end user. Current trends indicate that Baby Boomers will form an increasingly large percentage of the region's volunteer force, and that they intend to be more actively engaged in the community than the current generation of retirees. By working with local volunteer organizations and umbrella groups, the services provided by RIDE Solutions can easily be migrated to meet this additional transportation need.

## CAR SHARING SYSTEMS

Car sharing should not be confused with ridesharing. Car sharing is essentially a trip-by-trip car rental program. Typically, members join a car sharing system and pay a monthly fee for access to cars at various predetermined parking spaces or pods. The membership plans are similar to a mobile telephone plan. Generally, a certain number of miles at peak times or non-peak times are allocated based on the membership plan chosen. Car sharing systems transform the automobile from a possession to a service and typically take care of insurance, maintenance, taxes, and even gas. Car sharing systems are already present in large European and U.S. cities. In the Washington D.C. area, car sharing systems tie into the park-and-ride system at Metro stations.



Hypothetical RVAMPO Regional Car-Share System. Dots represent hypothetical car-share stations

A car sharing system in the RVAMPO would have the following advantages:

- 1) Provide predictable transportation expenses for those on a fixed budget (no surprise repairs);
- 2) Serve as a feeder system for fixed route transit or for node-to-node transportation; and,
- 3) Provide an opportunity for car share agencies to supply energy efficient vehicles for the system in order to minimize fuel costs.

Currently, the RVAMPO area may not have the market density to support a car sharing system. However, the future "Choice Rider" markets previously described could provide the necessary density and demand. In addition, such markets as Downtown residents might be possible markets for car sharing. A car sharing system would also benefit some of the carless -- but able bodied -- households, whose main barrier to car ownership is cost. These households could likely afford the minimal subscription service of car sharing, if they know that they aren't responsible maintenance or repair costs.

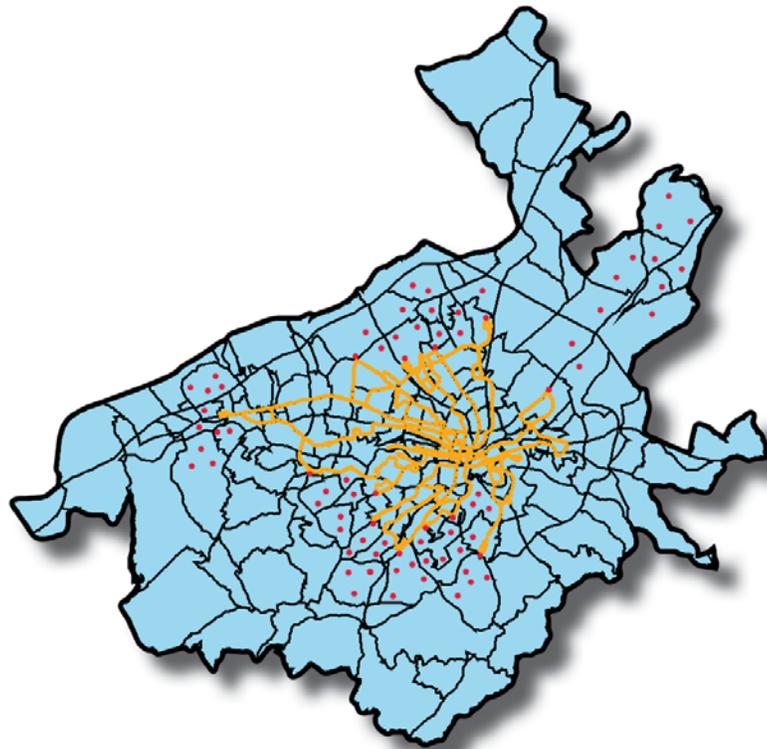
A car sharing system, as described here, would be operated and maintained by the private sector. Public sector participation could involve the construction, reservation, and leasing of public right-of-way for the car sharing parking spaces. Under a public-private partnership, parking spaces could be provided at select transit stops, and subscribers could receive a transit pass to complement their car sharing usage. In addition, car sharing subscribers could participate in a non-work trip ridesharing system, thereby sharing subscription costs with their ride share partners.

### PARATRANSIT OR TAXI FEEDER SYSTEMS

Paratransit or taxi feeder systems are designed to augment fixed route bus service by collecting customers from designated pick-up points and delivering them to a designated bus stop, but they are not a curb to curb service. Typically, feeder service fare is included in the transit fare. If this is not feasible a special flat-rate fare or transit transfer system can be established. Typically 30 minute advanced notice is necessary to use a feeder system.



The image at the right represents a conceptual feeder system based on CTPP analysis. The conceptual feeder system would work in a manner similar to the Car Share system on the previous page. In fact, a feeder system could supplement a car sharing system by addressing citizens who could not afford the minimum car sharing subscription service and by serving those who cannot drive themselves. Designated feeder system pick-up points and designated car sharing parking could be co-



located to serve a greater variety of citizens. Additionally the feeder system could be incorporated into a regional non-work trip rideshare system that could coordinate paratransit and taxi trips to pick up multiple rideshare participants.

It is currently unclear if transportation funds from the CL RTP can be used to help fund a feeder service. However, SAFETEA-LU's Planning Factor 7 encourages planners to "Promote efficient system management and operation," and a Paratransit/Taxi feeder system is one possible management transportation solution.

## BICYCLE AND PEDESTRIAN ACCOMMODATIONS AS FEEDER SYSTEMS

Bicycle and pedestrian accommodations are excellent transportation options for able bodied people of all ages and, when properly constructed, can even qualify as handicapped accessible. The image to the right illustrates what is possible using only 12 feet of paved surface. Such lanes may be retrofitted into the existing transportation system (with proper separation of course), or constructed adjacent or parallel to current infrastructure.

In Fiscal Year 2006 RVAMPO staff completed "Pedestrian Access to Commercial Centers: Connecting Residential and Commercial Land Uses." The study focused on 20 study areas with high residential population counts close to commercial land uses. The study found that in many cases there were no formal pedestrian facilities, sidewalks or other means to access the nearby commercial and retail establishments.

Safe pedestrian access to commercial and retail establishments would benefit citizens of all ages. A combination pedestrian/bicycle facility similar to the one shown above would greatly increase accessibility between residential, commercial, and retail establishments. The facility could also act as a feeder mechanism to bus stops, designated pick-up points, park and ride lots, or car sharing spaces. In addition the facility could serve a network of publicly available bicycles as described on the next page.



Each lane is 4 feet wide for a total of 12 feet - equivalent to a vehicle lane.



Bicycle and pedestrian facilities can accommodate electric scooters and similar vehicles, keeping them out of a dangerous situation in the normal street right-of-way.

Transportation safety can be enhanced by providing more bicycle and pedestrian facilities that can also accommodate the growing number of electronic scooters and similar vehicles. Currently such slow moving vehicles are often in the normal street right-of-way causing an unsafe situation for both the scooter driver and other drivers. These scooters are being advertised on television and the internet as being eligible for medicare and/or medicaid reimbursement. The combination of increasing numbers of retirees and subsidized electric scooters could cause an increasingly unsafe situation unless adequate parallel facilities are provided for bicycles, pedestrians, and electric scooters.

## PUBLICLY AVAILABLE BICYCLES AS FEEDER SYSTEM

Publicly available bicycle systems can range from the informal to the highly organized. One example of a highly organized system is the one in Lyon, France. It uses an extensive node system, with a kiosk and bicycle locking mechanisms, throughout the metropolitan area. The bicycles are free for one hour with a small rental charge for each additional hour of use. A two Euro coin is deposited in a special slot on the bicycle to unlock it from the post. The coin is returned to the user upon return of the bicycle to any of the nodes located in the metropolitan area. The deposit ensures that the bicycles will likely be returned to a node by either the original user or any other citizen wishing to obtain the 2 Euro coin.



Public Bicycle System Lyon, France - Bicycles are free for 1 hour and available for a small fee thereafter.

Sharebike.org is the Roanoke area's non-profit civic organization dedicated to publicly available bicycles. This service could be expanded to tie into Valley Metro's fixed bus routes. Many Valley Metro buses now have bicycle racks attached to the front of the vehicle. Public bicycle racks or pods could be provided at strategic bus stops and other locations. Public bicycle racks could also be developed along with bicycle and pedestrian lanes as described on the previous page.



Bicycle racks on Valley Metro Busses.

Funds for the construction of bicycle and pedestrian lanes and/or for the construction of bicycle racks should be eligible for inclusion in the CLRTP.



Sharebike.org - Roanoke Based

## COORDINATED HUMAN SERVICE MOBILITY PLAN - IDENTIFIED STRATEGIES

### COORDINATED HUMAN SERVICE MOBILITY PLAN - IDENTIFIED STRATEGIES

In 2006, RVAMPO developed a Coordinated Human Service Mobility Plan in partnership with Virginia Tech Transportation Institute, RVARC, New River Valley Planning District Commission and the Blacksburg-Christiansburg-Montgomery MPO. In 2008 the Virginia Department of Rail and Public Transportation (DRPT) developed and updated CHSM Plans for all planning districts in the Commonwealth of Virginia. The plan for RVARC (PDC #5) covers the vast majority of the RVAMPO study area. The updated CHSM Plan was finalized by DRPT and its consultants in September 2008. The updated plan identifies 11 strategies, listed below, from which to develop specific CHSM projects. Projects receiving funding from the following categories need to be referenced in a CHSM plan: S. 5310 – Elderly and Disabled, S. 5316 – JARC, and S. 5317 – New Freedom. Several of the following strategies are further developed on previous pages of this section.<sup>1</sup>



1. Continue to support and maintain capital needs of coordinated human service/public transportation providers.
2. Support new mobility management and coordination programs among public transportation providers and other human service agencies providing transportation.
3. Expand availability of demand-response service and specialized transportation services to provide additional trips for older adults, people with disabilities, and people with lower incomes.
4. Provide flexible transportation options and more specialized transportation services or one-to-one services through expanded use of volunteers.
5. Provide targeted shuttle services to access employment opportunities.
6. Expand outreach and information on use of available mobility options in the region.
7. Establish a ride-sharing program for long-distance medical transportation.
8. Implement new public transportation services or operate existing public transit services on a more frequent basis.
9. Expand access to taxi services and other private transportation operators.
10. Establish or expand programs that train customers, human service agency staff, medical facility personnel, and others in the use and availability of transportation services.
11. Bring new funding partners to public transit/human service transportation.<sup>4</sup>

4. RVARC CHSM Plan pages 35 and 36

### POTENTIAL TAZ LEVEL EFFECTS

Retirement of the Baby Boom generation could have an effect on future demographic, population, and employment estimates for TAZs that have existing large scale retirement communities or assisted living centers. Some of these TAZs are listed below with 2035 population and employment estimates based on regional trends. Also included are revised 2035 population and employment estimates based on input from the management of retirement facilities in the TAZs about possible future expansion plans to serve the Baby Boom generation's retirement needs. *Note: the travel demand model (chapter 5) used the original figures to derive model results.*

The Friendship Retirement Company operates two campuses in TAZ 339. The campus on Dent Road is bordered by one of Roanoke Regional Airport's runway approach zones and Regional Airport owned land. The campus on Hershberger Road is not significantly affected by Regional Airport approach zones and has room to grow.

TAZ 339	Population Estimates	Employment Estimates
2035 Estimates	1,038	506
Revised 2035 Estimates	1,113	512



TAZ 339 - Friendship Retirement Inc.

Richfield Retirement Center is in TAZ 322.

Population Year 2035 1312

Employment Year 2035 1344

Management of Richfield Retirement Center indicated that current estimates are adequate due to their future strategic plans.



TAZ 322- Ritchfield Retirement Inc.

Brandon Oaks is in TAZ 72.

TAX 72	Population Estimates	Employment Estimates
2035 Estimates	1,038	336
Revised 2035 Estimates	1,113	512



TAZ 72 - Brandon Oaks

Brandon Oaks has maxed out the density allowed by zoning on their current property. There are two adjacent properties that could provide room for expansion should they come on the market. Management has been interested in acquiring these properties in the past but has not yet found willing sellers.

The following two population and employment projection revisions are based on acquiring either one or both of the properties:

TAZ 72	Population Estimates	Employment Estimates
Acquiring one property before 2035	944	340
Acquiring both properties before 2035	1,057	341

Pheasant Ridge is in TAZ 87.

Pheasant Ridge Management stated that their typical market planning process is short term. Generally, management plans for the next building based on the current building's market performance. With this in mind, management estimated that a maximum of 6 buildings might be added over a 30 year time horizon. This would lead to the revised estimates.

TAZ 87	Population Estimates	Employment Estimates
2035 Estimates	1,042	945
Revised 2035 Estimates	1,378	946



TAZ 87 - Pheasant Ridge

### MULTIMODAL/VILLAGE CENTERS

Many of the suggested strategies in this scenario could be addressed by placing multimodal hubs in existing village centers. Village Centers are being promoted by both the City of Roanoke and Roanoke County planning processes. An illustration of multimodal center elements is depicted below.

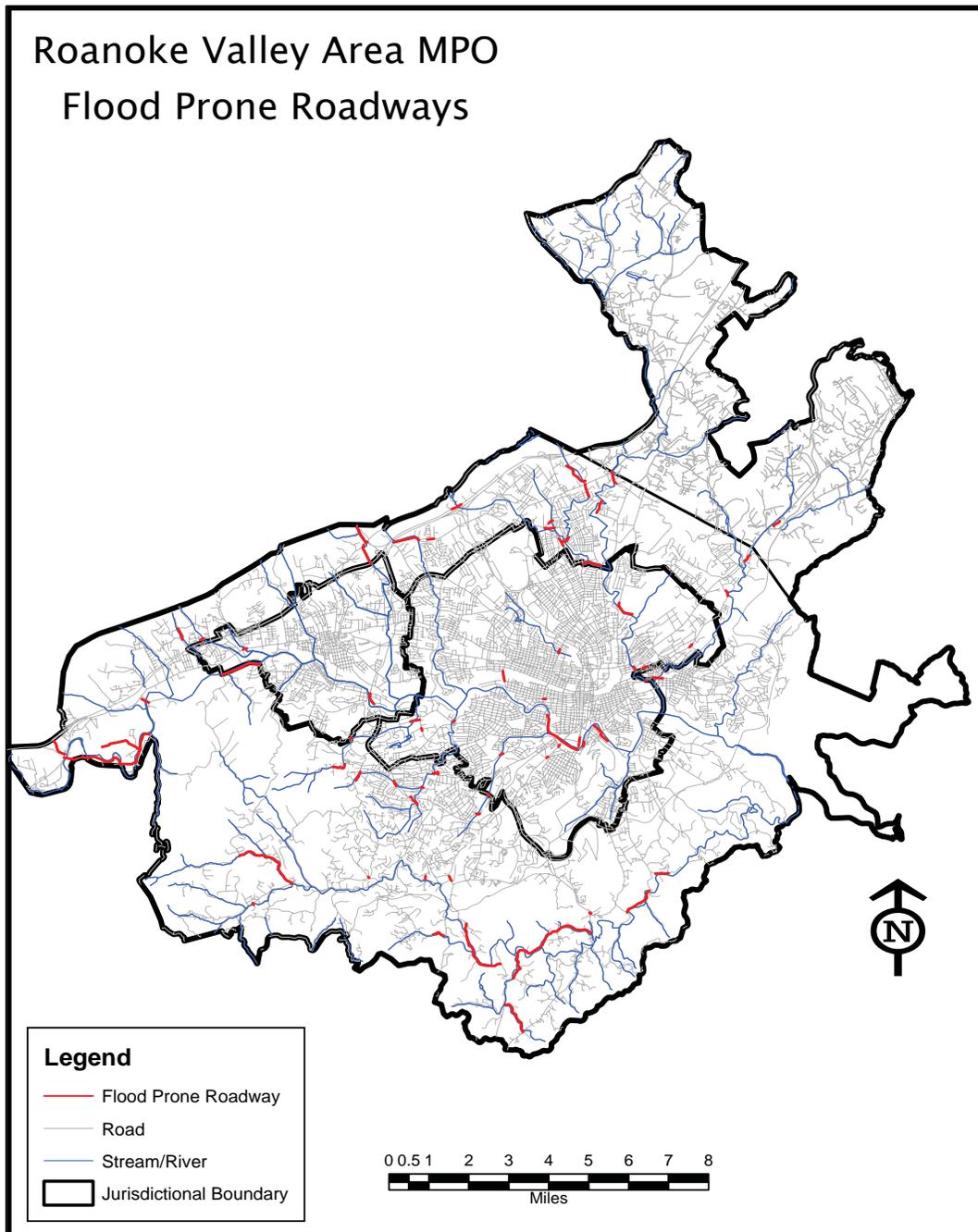


## GLOBAL CLIMATE CHANGE - ADAPTATION

### FLOODING

This scenario deals with possible effects and possible adaptations to Global Climate Change. Chapter 12 will describe environmental planning as it relates to regional air-quality and transportation planning. Chapter 12 will also discuss specific pollutants and greenhouse gases in general.

The most likely negative effect of global climate change on RVAMPO would be a change in weather patterns which would produce more flooding. In FY2006 RVAMPO and RVARC produced a joint "Flood Prone Roadway" study. Flood prone roadways within the RVAMPO study area are depicted below:



## FLOOD PRONE ROADWAYS

The flood prone roadways were determined by comparing the intersection of flood plains with transportation infrastructure, historical records of past flooding, and expert input from public works and emergency services personnel. A variety of situational and design variables determines whether a roadway floods. Using Geographic Information Systems (GIS) to identify roadway segments in the flood plain in combination with input from public and emergency services personnel presents a more accurate picture than using GIS data alone.

The following tables contain flood prone roadways by locality within the RVAMPO service area. The cities of Roanoke and Salem and the Town of Vinton are completely contained within the RVAMPO boundary. Only portions of the counties of Botetourt and Roanoke are within the RVAMPO study area.

Route Name	Flooding Location Description
10th Street	Intersection of Shadelawn Avenue
13th Street	Intersection with Eastern Avenue and Tinker Creek
Arbor Avenue	Riverview Area
Arbutus Avenue	Riverview Area
Baldwin Avenue	Intersection with Tuck Street
Bennington Street	Jamestown Area
Boulevard Street	Intersection with Salem Ave. (Shaffers Crossing)
Brambleton Avenue	Crossing of Murray Run Creek
Campbell Avenue	Near intersection of 10th Street
Cravens Creek Road	Intersection with Deyerle Road
Deyerle Road	Intersection with Valentine Road
Edgewood Street	Near intersection with Brandon Road
Franklin Road	Intersection with Brandon Road
Franklin Road	Intersection with Broadway Avenue
Jefferson Street	Intersection with Reserve Avenue
King Street	Intersection of Berkeley Avenue and Richards Avenue
Piedmont Street	Intersection with Hamilton Terrace
Wiley Drive	Various spots
Wise Avenue	Crossing of Tinker Creek

City of Roanoke - Flood Prone Roadways

Route Name	Flooding Location Description
Apperson Drive	Between Orchard Drive and Riverside
Colorado Street	Between Rowan Street and Riverside Drive
East Main Street	Intersection with Kessler Mill
East Riverside Drive	Between Apperson and McVitty
Electric Road	Near intersection with Apperson Drive
Epperly Lane	Kessler Mill Road to Terminus
Front Avenue	Between Riverside Drive and Riverside Drive
Horner Lane	Near Wildwood Road
Lancing Drive	Salem Ridge Apartments, aka Willow River
Mill Lane	Between West Main Street and Riverside Drive
Pine Bluff	Kessler Mill Road to Sycamore
River Side Drive	Apperson Drive to Colorado Street
Sycamore Drive	Pine Bluff to Terminus
Union Street	Between Fourth Street and Eddy Street
West Main Street	Intersection with Wildwood Road
West Main Street	Between Poplar Street and Turner Street
Wildwood Road	Intersection with West Main Street

City of Salem - Flood Prone Roadways

Route Name	Flooding Location Description
Hardy Road	Town of Vinton / City of Roanoke CL
Virginia Avenue	Town of Vinton / City of Roanoke CL
Walnut Avenue	From 4th Street to 8th Street

Town of Vinton - Flood Prone Roadways

Route Name	Flooding Location
Tinker Mill Road	Daleville area 0.5 miles west of US 220
Willowbrook Lane	Glade Creek near Willow Brook Mobile Home Park

Botetourt County (portion within RVAMPO 2035 Study Area Boundary) - Flood Prone Roadways

Route Name	Flooding Location
Back Creek Rd.	Between US 220 and SR 615
Bandy Rd.	Middle Back Creek Bridge
Bandy Rd.	5000 Bandy Rd.
Barley Dr.	Various spots near River
Bent Mountain Road	Intersection of Twelve O'Clock Knob Road (SR 694)
Carson Rd.	Near intersection with Lake Back O Beyond Dr.
Cartwright	Near Crystal Creek
Clearwater Ave.	Various spots near Creek
Coleman Rd.	Various points
Cotton Hill Rd.	West of Intersection with Route 613
Crawford Road	400 block
Creekwood Dr.	Near intersection with Beaverbrook
Cresthill Dr.	Garst Mill Bridge
Dent Rd.	From Williamson Rd. to Brookside
Dutch Oven Rd.	Various spots near Creek
Electric Rd.	Near intersection with Cordell Dr.
Electric Rd.	Intersection with McVitty Rd.
Ferguson Valley Rd.	Various spots along Creek
Five Oaks Road	Intersection with Bent Mountain Road
Florist Rd.	Near intersection with Verndale Dr.
Garst Mill Rd.	Near Intersection with Halevan Rd.
Glade Creek Rd.	Near intersection with Bonsack Rd.
Grandin Road Extension	West of Meadow Creek Drive (1390)
Green Ridge Rd.	3000 Block of Green Ridge Rd.
Halevan Road	At Garst Mill Park Road
Harwick Dr.	Various spots
Hershberger Rd.	East of intersection with Plantation Rd.
Indian Head Rd/Bohon Hollow Rd.	Various spots
John Richardson Rd.	Near intersection of Hershberger Rd. and Plantation Rd.
Keagy Rd.	4400 Keagy Rd.
Kessler Mill Rd.	Various spots
Lakemont Drive	Various locations
LaMarre Dr.	Various spots near Creek
Little Bear Rd.	Various spots

Roanoke County (portion within RVAMPO 2035 Study Area Boundary) - Flood Prone Roadways - Table I

Route Name	Flooding Location
Loch Haven Rd.	2 miles east of US 419
McVitty Rd.	Intersection with Castle Rock Rd.
McVitty Rd.	3100 McVitty Rd.
Merriman Rd.	Near Penn Forest Elementary
Ogden Rd.	At Pebble Creek
Old Mountain Rd.	Various spots near Creek
Palm Valley Rd.	Sun Valley Subdivision
Plymouth St.	Near Brookside
Ran Lyn Dr.	Near Intersection with South Roselawn
River Rd.	Various places near river
Shadwell Rd.	Near intersections with Ashton Rd. and Summerview
South Campus Dr.	Various spots near Creek
Starkey Road	At Back Creek Tributary B
Starlight Ln.	Between Boones Chapel Rd. and Blue Ridge Parkway
Sugarloaf Mountain Rd.	Near Mud Lick Creek
Texas Hollow Rd.	Various spots
Tree Top Camp Rd.	Various spots
Twelve O'Clock Knob Road	Various locations
Verndale Dr.	Sun Valley Subdivision
West River Rd.	Various places
West Riverside Dr.	Various spots near River
Willow Branch Rd.	Various spots near Creek
Wood Haven Rd.	Near intersection with Willow Creek Dr.
Yellow Mountain Rd.	Near intersection with US 220

Roanoke County (portion within RVAMPO 2035 Study Area Boundary) - Flood Prone Roadways - Table 2 - Continued from Previous Page

GIS analysis reveals that the linear distance of flood prone roadways within the GIS RVAMPO study area boundary is 27.18 miles. According to VDOT project cost estimates, if 2 lanes, on average, had to be reconstructed due to excessive and repeated flooding on the entire 27.18 miles the total would be approximately **\$84 million in current dollars**. Similarly if 2.5 lanes, on average, had to be reconstructed the approximate total would be **\$122 million in current dollars**. Although these figures represent worst case scenarios (complete or near-complete reconstruction of flood prone roadways) it is important to keep this climate change related possibility in mind for the long-range transportation planning process.

---

---

## POTENTIAL TAZ LEVEL EFFECTS

Increased flooding due to global climate change will not only affect transportation safety and transportation maintenance costs due to flood prone roadways, it may also alter future population and employment predictions at the TAZ level. Residential and commercial structures within the flood plain may or may not be rebuilt after a catastrophic flood. The decision to rebuild will be affected by flood insurance program rules, local government zoning, and state health and safety regulations. Structures that are rebuilt after a catastrophic flood are often redesigned to either raise the entire structure above the flood plain or to place residential or office space above the first floor. Due to the multitude of health and safety regulations, insurance rules, and design considerations involved, it is impossible to forecast exactly how many residential or commercial structures will be rebuilt after a catastrophic flood. Instead, the methodology employed in this scenario seeks to establish a possible maximum population and employment loss due to a catastrophic flood on a TAZ by TAZ level. This maximum loss assumes 100% of affected structures being removed from the flood plain. Actual flood plain development loss will undoubtedly be below this maximum estimate.

This methodology uses aerial photography to visually inspect the number of land parcels and the structures on each parcel affected by the 100-year flood plain (Flood Elevation Certificates 2002) using GIS software. Once the number of structures is determined the following are used to determine maximum population and employment reductions per TAZ:

- 2.5 persons per single family housing unit
- multi-family housing unit based on visual inspection (24 persons default)
- employment based on visual inspection of building size and business type

The following map is an example of this, indicating affected parcels in the Town of Vinton.

Town of Vinton - TAZs outlined in yellow. 100 year flood plane (2002 Flood Insurance Certificates) displayed in light blue. Further detail on example TAZs follow on the next page.



### TOWN OF VINTON

Using TAZ 200 to demonstrate this methodology, GIS software yields the following results:

**Number of Parcels Affected: 47**

**Number of Residential Structures Affected:** 39 single-family and 8 multi-family

**Number of Commercial Structures Affected: 8**

**Estimated Maximum Population Displacement: 290**

**Estimated Maximum Employment Displacement: 100**



TAZ 200 - Town of Vinton, Virginia

The following table summarizes estimates for affected TAZs within the Town of Vinton.

TAZ	Parcels Affected	Residential Structures	Commercial Structures	Maximum Population Affected	Maximum Employment Affected
200	47	39 single, 8 multi	8	290	100
202	14	17 single, 5 multi	2	83	30
208	2	0	2	0	350

Affected TAZs in Town of Vinton - Visual Representation of Affected TAZs similar to TAZ 200 example available in a separate report.

### CITY OF ROANOKE



TAZ 15 City of Roanoke



TAZ 78 City of Roanoke

Two of the affected TAZs in City of Roanoke. The table on the following page(s) summarizes all affected TAZs in City of Roanoke. Each affected TAZ has a similar aerial image that is available in a separate report.

**CITY OF ROANOKE**

<b>TAZ</b>	<b>Residential Structures</b>	<b>Commercial Structures</b>	<b>Maximum Population Affected</b>	<b>Maximum Employment Affected</b>	<b>Notes</b>
38	17	1	43	32	
89	12	0	95	0	
67	0	25% of total	0	273	
34	0	80% of total	0	960	NS facilities
31	62	3	155	45	
30	13	3	33	296	
27	74	100	185	100	
28	0	95% of total	0	95% of total	site design
4	0	95% of total	0	95% of total	site design
2	0	20% of total	0	20% of total	Downtown
32	20	10	50	300	
51	10	0	25	0	
49	33	3	83	20	
52	9	4	23	40	
53	14	0	35	0	
1	0	50% of total	0	50% of total	Coca-Cola
33	4	50% of total	10	440	
15	27	80% of total	68	357	
17	0	70% of total	0	500	
88	0	15% of total	0	173	
3	0	6	0	150	
7	45	4	113	75	
8	0	5	0	94	
10	74	27	185	638	
11	20	0	115	0	
70	10	0	25	0	
48	14	3	35	10	
75	31	10	515	559	
60	22	0	55	0	
62	4	3	80	50	
63	3	8	8	82	
78	115	21	390	181	
73	1	12	3	546	

City of Roanoke affected TAZs part I - Flooding issue in established areas such as "Downtown" or established industrial parks will likely be addressed by site and structural design and rehabilitation. These areas are indicated in the "notes" column.

TAZ	Residential Structures	Commercial Structures	Maximum Population Affected	Maximum Employment Affected	Notes
72	15	1	38	15	
71	19	0	48	0	
24	70	4	175	35	
25	16	4	40	30	

City of Roanoke affected TAZs part 2

### CITY OF SALEM

TAZ	Residential Structures	Commercial Structures	Maximum Population Affected	Maximum Employment Affected	Notes
122	19	2	48	50	
108	19	11	48	321	
109	3	5	8	298	
110	139	4	348	30	
111	0	1	0	100	VA Hospital
112	0	5	0	611	
121	7	5	678	30	multi-family
116	83	15	268	204	
117	178	9	445	50	
115	0	70% of total	0	2944	
105	21	7	53	100	
107	14	6	35	378	
100	0	6	0	134	
101	0	6	0	67	
102	9	7	250	100	
124	15	0	38	0	
119	9	0	23	0	
118	30	37	75	375	
129	11	22	28	353	
120	5	5	13	302	
128	4	37	10	604	
126	42	7	105	84	
127	27	3	68	40	

City of Salem affected TAZs - Note: TAZ 121 has a series of affected multifamily structures, leading to a large maximum estimate of population affected.

**ROANOKE COUNTY**

<b>TAZ</b>	<b>Residential Structures</b>	<b>Commercial Structures</b>	<b>Maximum Population Affected</b>	<b>Maximum Employment Affected</b>	<b>Notes</b>
321	2	10	5	285	
369	23	0	58	0	
367	34	0	85	0	
373	21	7	53	15	
333	28	3	70	10	
332	18	0	45	0	
339	6	7	30	60	
341	21	6	98	71	
344	7	3	18	37	
343	56	0	140	0	
300	10	1	25	10	
311	12	0	188	0	
315	25	0	63	0	
359	18	4	45	20	
310	5	6	13	92	
361	7	0	18	0	
362	19	1	48	0	
366	11	2	28	42	
320	21	1	53	66	

Roanoke County affected TAZs

**BOTETOURT COUNTY**

<b>TAZ</b>	<b>Residential Structures</b>	<b>Commercial Structures</b>	<b>Maximum Population Affected</b>	<b>Maximum Employment Affected</b>	<b>Notes</b>
401	0	5	0	118	

Botetourt County affected TAZs



TAZ 401 - Botetourt County

## FUEL AND ENERGY PRICES

### HIGH FUEL PRICES

This scenario briefly discusses the possible ramifications of fuel prices remaining relatively high in the mid and long term. The East-West Gateway Council of Governments (Gateway COG) serving the St. Louis metropolitan region, recently completed research into the effects of sustained fuel prices and Vehicle Miles Traveled (VMT.) The Gateway COG presented their research at the 2008 Association of Metropolitan Planning Organizations conference in Seattle, Washington. The main findings from this research, which employed a national data source, are as follows:



"Trends in Regional Traffic Volumes: Signs of Change?" October 29, 2008 - AMPO Annual Meeting, Seattle, Washington

The figure above indicates that if gasoline prices rise 10% and stay at that price for one year, it is predicted that VMT will be reduced by 1.1% from the level before the rise in price. Likewise, if gasoline prices rise 10% and stay at that level for five years, the VMT will be reduced by 3.9% from the original level. The research does not indicate whether the reductions in VMT are a result of mode shifting (carpool, vanpool, transit or bicycle) or if they represent trips that are foregone. It is likely that some of the trips are foregone and others are shifted to another transportation mode. Of course, if fuel prices experience a greater than 10% rise, the reductions in VMT are likely to be larger than those previously cited. One cannot simply assume the reductions in VMT to be simple linear projection from the 10% figures. At different price levels, different relationships between fuel prices and VMT reduction may result, but any sustained average increase in fuel prices should increase demand for bicycle, carpool, and transit modes of transportation. Many of the strategies presented in the Baby Boom Retirement scenarios would be applicable under a higher (inflation adjusted) average future fuel price. In fact, the presenters from East-West Gateway COG related the age of the population with annual miles driven in the United States.

## Age of the Population

Annual Miles Driven, US	
Age of Driver	Annual Miles
0-15	353
16-19	6,638
20-24	13,982
25-29	15,902
30-34	16,265
35-39	16,309
40-44	15,817
45-49	15,674
50-54	14,733
55-59	13,753
60-64	12,124
65+	8,223

Source: National Household Travel Survey, 2001

"Trends in Regional Traffic Volumes: Signs of Change?" October 29, 2008 - AMPO Annual Meeting, Seattle, Washington

The above chart indicates that on average, drivers 65 or older only drive around 8,223 miles per year compared to 16,309 per year for drivers in the 35 to 39 year old age range.

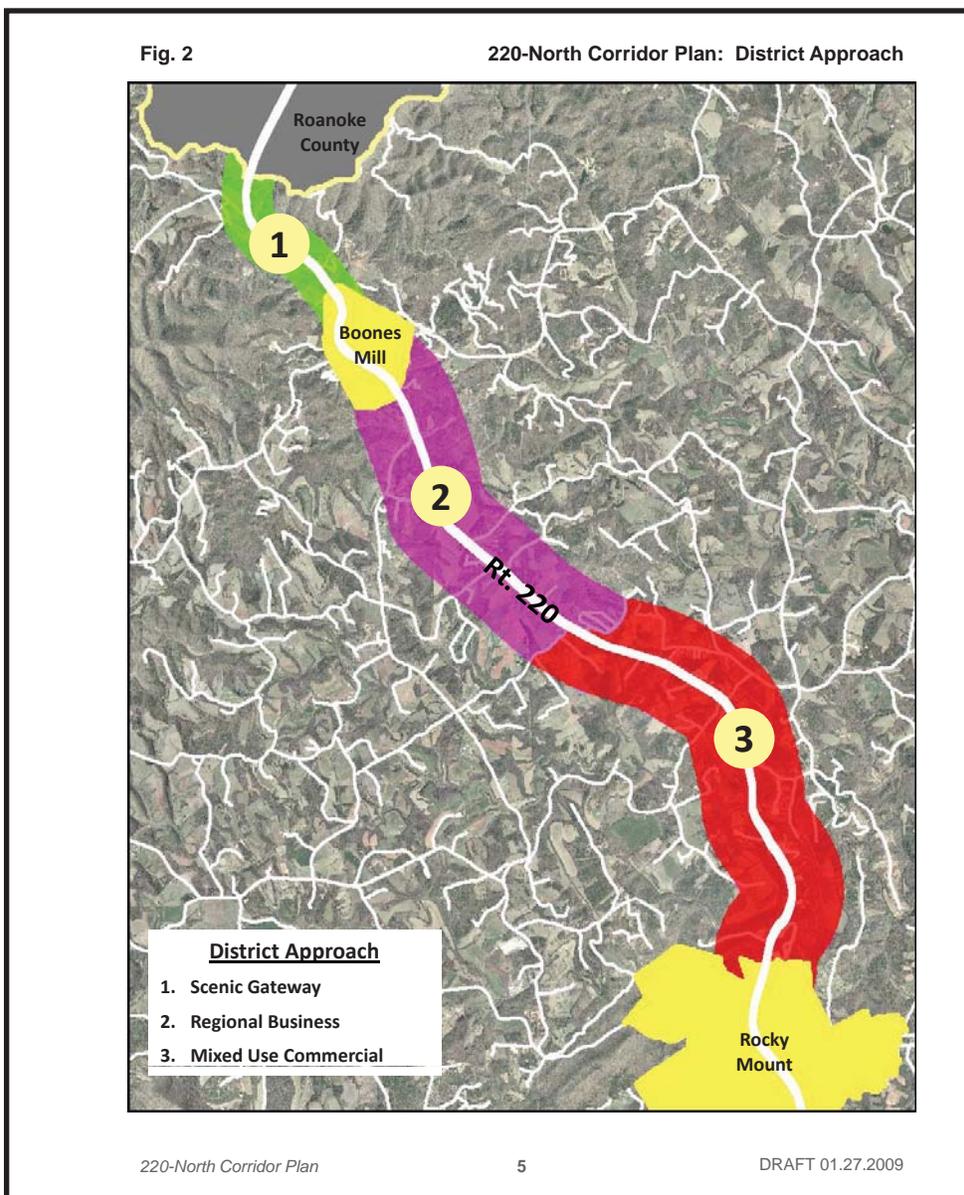
As with the fuel price results, the research does not indicate if the reduction in annual mileage for the 65 and over age range is primarily from shifting to transit or if the trips are simply foregone altogether. In any case, a scenario of both higher fuel prices and an aging population would indicate reduced average VMT during the time horizon of this plan and an increased demand for the transit, carpool, and car sharing strategies mentioned in the Baby Boom Retirement scenario.



## WATER AND SEWER SERVICE EXPANSION

### FRANKLIN COUNTY

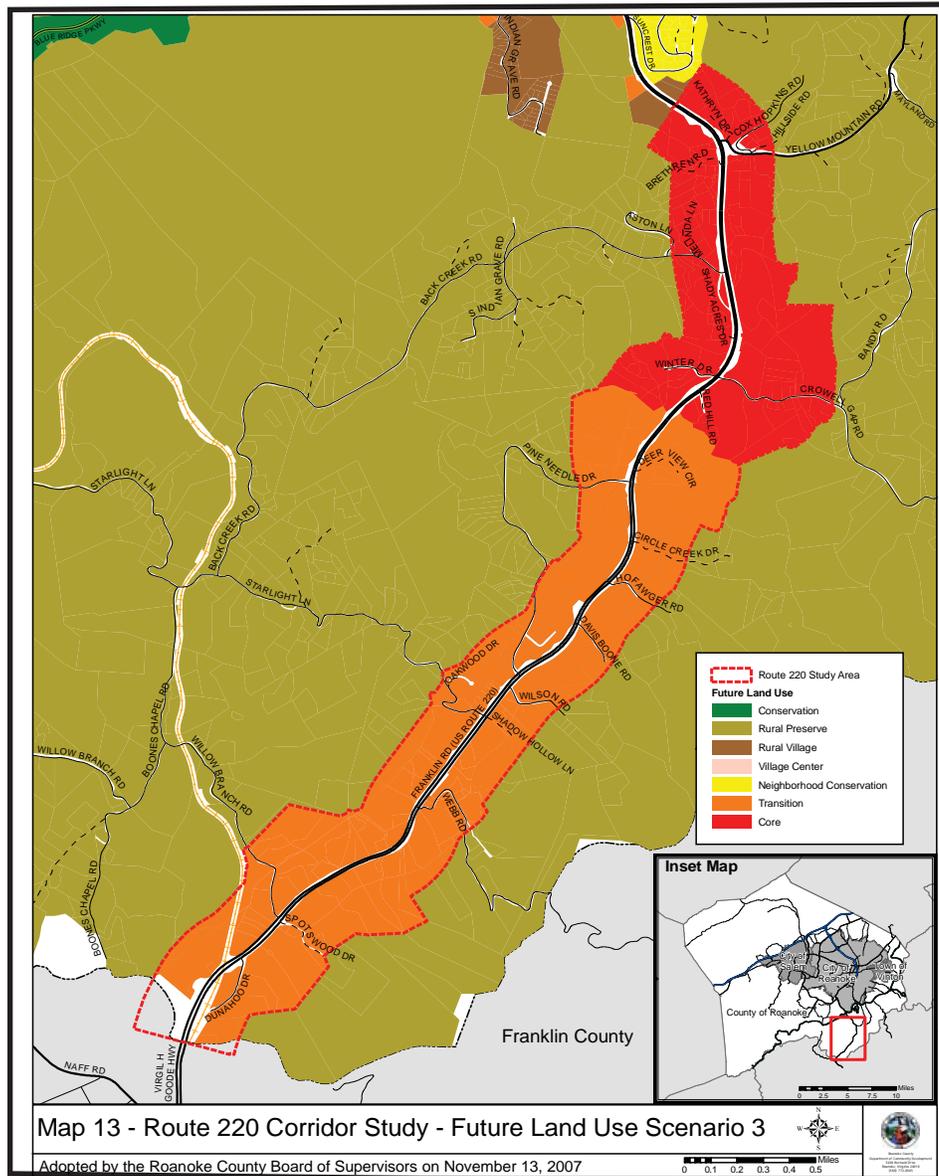
The Western Virginia Water Authority plans to extend a 12-inch water line from southern Roanoke County deep into neighboring Franklin County. The current RVAMPO study area boundary ends at the Roanoke County/Franklin County border in the US 220 Corridor. The extension of the water line may enable development in Franklin County that would necessitate inclusion in future RVAMPO transportation planning. Fortunately, Franklin County has been pro-active in planning for the water line extension. A map of proposed overlay districts to correspond with the water line extension follows:



The Scenic Gateway, the district closest to the RVAMPO 2035 study area, calls for a preservation of the current scenic character of the corridor and consequently allows for lower levels of development than the other districts. The Regional Business and Mixed Use Commercial districts allow for more commercial development in the corridor south of the Town of Boones Mill to the Town of Rocky Mount.

It is difficult to predict if the development resulting from the water line extension in the Regional Business and Mixed Use Commercial districts will be enough to extend the RVAMPO Urban Area Boundary into Franklin County, but it is a possibility despite the fact that the district which allows the least development is closest to the current RVAMPO boundary.

Likewise, Roanoke County developed a draft study for the US 220 Corridor (see map).



The Roanoke County Future Land Use map classifies the majority of this corridor as “Transition.” The definition of Transition is as follows: A future land use area that encourages the orderly development of highway frontage parcels. Transition areas generally serve as developed buffers between highways and nearby or adjacent lower intensity development. Intense retail and highway oriented commercial uses are discouraged in transition areas, which are more suitable for office, institutional and small-scale, coordinated retail uses. It remains to be seen if future comprehensive plans for either county maintain low density land uses once the water line has been constructed.